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Machine Learning for Prediction of Noise Pollution

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Abstract: Noise pollution is a developing problem now a days. The quickest effect is an illness of human mental health. Now days sleep disorder is a serious cause. Continuous propagation of noise can create frustration. Noise can make a more contribution to cardiovascular effect in human beings. That is a reason it is very difficult to live a healthy life for all. This system work on the methods of Internet of Things (IOT) which is an evolving technology. It also check the live intensity of noise in a particular area and also maintain a log over the internet, for further analysis and prediction. This system sensing the presence of polluted noise range. A micro controller is use to process the noise data and generate reports for authorities to keep a watch and take some precaution over the excessive noise. It also classify the noise using machine learning algorithm. This system can be used in various areas. It can be use near schools, college campus, hospital and no honking area and traffic areas.

Index Terms **- Noise Pollution Prediction, Noise Pollution Monitoring, Noise Tracking, Noise Pollution Prediction Using Machine Learning, IOT Based Noise Tracking Device.**

I. INTRODUCTION

Noise is any uncomfortable sound present in the environment. Extreme loud or unpleasant noise that causes disturbance. Most of noise is caused by machineries and heavy transports. Continuous propagation of noise can do harmful impact on human as well as animal health. Some of the main sources of noise are in residential areas include club music, parties, Heavy transportation, machinery, construction and sudden explosions. Noise pollution will cause cardiovascular disease, increase mental stress, disturbance in task, tinnitus, hearing damage and sleep disturbances, are the harmful and troubling effects. Fig. 1. Shows the different elements produce the noise, as per the committee of Noise Pollution control, bearable limit of noise in residential areas up to 55 dB during the day and 45 dB in night. While in industry it is considered up to 70-75 db. World Health Organization (WHO) allowed 50 dB noise range for residential areas. Research suggests that sound pollution is that the highest in low financial gain and industrial minority neighborhoods. High noise levels will do result on artery effects in humans Associate in Nourishment a magnified the results arterial blood vessel sickness.

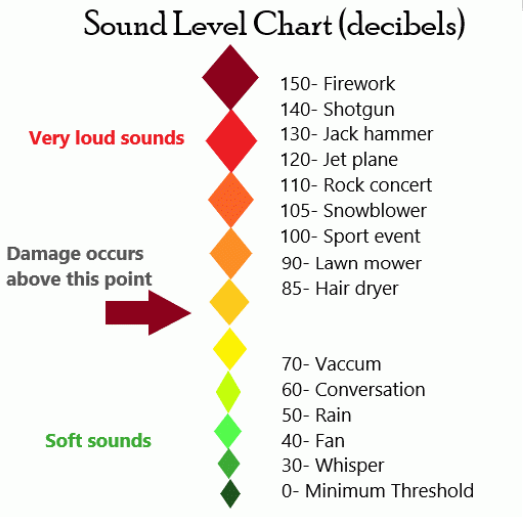

Fig. 1 : Sound Level Chart Scale (decibels)

One survey say's that, approximately 85% of Sweden city stay in the noise polluted areas, so their life style suffering from noise. World Health Organization (WHO) recommends that to allow less than 30 dB noise level inside the bed room. In the classroom less than 35 dB noise is considerable, Not to disturb. Recent studies have located that exposure to noise pollution may also boom the risk for fitness troubles including coronary heart assault obesity hearing impaired sleep disorder or depression.

Following the Environmental Noise Directive (END) 2002/49/EC, each EU member state that to assess environmental noise and develop noise maps every five years. Hazardous or unpleasant noise should do high impact on human, occurs for only few minutes to hours. But due to lack of some manpower of resources it is not easy to monitor or plan to measure noise frequency. IOT based module is

to reduce the human interference while collecting or monitoring data. When you need to monitor the noise in area, just connect it with network. And start analyzing the data. IoT technology has power to connect all devices are in one roof. And centrally controlled from mobile application.

1.1. Motivation -

Due to the huge development in cities as well as villages, Sound pollution cause the effect on human health. The major effect due to the noise is a mental illness, disturbance, sleep disorder, Extreme noise can increase frustration levels. Long term of loud sound can make a more contribution to cardiovascular diseases, it is related to the heart blood flowing mechanism in human beings. So, considering all the sources of noise pollutants, Here a plan to develop a system to monitor and analyze the harmful range of noise range. This system can be place near Hospitals, Schools and Libraries.

1.2. Objectives -

- To develop the efficient collection and generation of noise prediction system.
- To monitor and make datasets of collective noise for analysis.
- To perform and implement data analytics over the collected noise data.
- To perform and implement graph generation methodology for evaluation of captured noise range.
- Applying machine learning algorithm to predict the harmful range from data.

1.3. Dissertation work -

Noise pollution produce high impact on human health. These effects will not become happened immediately, but they can harm slowly later on. Compressors, generators, and Heavy transports are the sources of noise close noise is totally different throughout day or night and in rural area. Referencing all the previous research as well as articles, Here, I have plan to develop the noise monitoring system. So this implemented system is based on Internet of thing (IOT) technology, it is an emerging technology, All types IOT base devices connection and monitor under these technology, Main advantage of this technology is having less human intervention.

The implemented system is based on IOT based noise monitoring and prediction system. Main aim of these system is to predict the harmful noise range and monitored data log. With the help of Sound sensor and NodeMCU module as part of these system. NodeMCU is less costly but highly equipped with feature. Noise is captured through the microphone and recorded signal pass through NodeMCU microcontroller and sent over. These captured data is shown in the form of graph, these graph is generated with the help of the google API's. This accurate tracking of measured signals. System is continuously measure and monitor the parameter until they get power off. For prediction of noise data here system used Machine Learning Naïve Bayes Classification algorithm to predict harmful noise range. After every period of time the log is generated, these log is further use for research on pollution noise.

II. LITERATURE SURVEY

Every technology has some background, To make any product, It need to identify the requirements, previous work, diagrams, results and other related documents. Here the implemented system is made of from the number of base paper as well as research paper ideas.

Moukas et al. said that, their system named as "Automatic Noise Monitoring System" is the best noise monitoring instrumentation in industry, and also it is currently available to monitor the intensity of noise and duration of time. The incidence of noises may be recorded.

Their source often cannot be identified studies directed towards providing directed towards providing improved instrumentation which can identify sound sources is described.[1]

Also mudakam et al. said that the increment of technologies and development can create huge milestones. At early days, there is a sea change in human's daily life as well as in working conditions in organizations after the arrival of IT and ITeS technologies. The huge development of the Internet of Things [IoT] has been primarily driven. It needs to analyze and conquer large number of corporations.

Anjaiah Guthi said, they developed the system that deals with the smart sensor network concept. And it is an emerging field of research which combines number of problem statement. Number of challenges in computer science, wireless communication and electronics. In that monitoring noise levels in industrial environment and the area of interesting using wireless systems. While the whole representation of the hardware and its components is evaluated using original implementation using arduino UNO board, sensor and its supporting components.[2]

Martina Marjanovic et al. have proposed the studies is focused on growing a fine-grained pollutants and noise maps to become aware of urban regions with important bad impact on human fitness. More specifically, we show a practical experience of a real-world system deployment, from sensor calibration to data acquisition and analysis.[3]

Noise pollution has negative consequences to human health such as hearing loss, stress, blood pressure changes, migraine, and insomnia, nervous system problems, productivity limitations, mental health problems, and other difficulties. Noise Pollution Measurement System which integrates a Wireless Sensor Network (WSN) and a Body Access Network (BAN) capable of measuring noise pollution levels as well as monitoring its health effects on humans. The WSN and BAN network to identify the risks of uncontrolled noise levels and its effects on the health of humans.[4]

Kulkarni Chaitanya et al. have proposed the system which can detect the harmful gases and Excessive noise. This system is new concept which can detect both Air and Sound pollution. The main part of this system is to sense the environmental conditions. The sensor we are using here is MQ135 and Microphone sound sensor. Sensor MQ135 is air quality sensor which is used to detect the harmful gases like NH3, CO, CO2 and SO2. The MQ135 sensor is sense the condition and gives the signal.[5]

Piyush Patil have proposed system provides the solution to these problems with the help of internet of things. Our system Monitor the pollution and noise created by vehicle and if any vehicle crosses its threshold value then it will get reported to the traffic department and agencies of national environment.[16]

Dr. A. Sumithra et al. have proposed the concept of a smart city. In that they used various sensors and modules to monitor the various environmental parameters. Their system uses air and sound sensors to monitor the data and then upload the data on the cloud server. The cloud storage manages the captured data and analyze it.[7]

Thomas Zimmerman and Christine Robson have proposed a noise model and data representation techniques that prospective homeowners. They try to find and monitor how much effect generated by Resident, at night time noise is modeled as an ambient. After that the complete execution of phase it try to alert with a Sms, This is an extracted feature of this system. The noise analysis output sent

over SMS text message when the peak value provides a quantitative analysis of the noise environment. A device that implements the noise model has been build, calibrated and verified.[8]

2.1. Summery and Discussion -

Due to the increment of noise pollution, every researcher wants to research on polluted noise. Author of the paper implemented the system named as "automatic monitoring of noise" is the best Instrumentation that currently available for the automatic monitoring of noise intensity, it also provide the collective with time to identify the noise sources with high frequency.

Here "smart sensor network concept" that is an emerging field of research which combines many challenges or computer science, wireless communication and electronics. Proposed by Author Anjaiah Guthi. Cantuna has planned the "Noise Pollution measure System" that integrates a wireless detector network wsn and a body access network ban capable of live its health effects on humans. Number of sensors and modules is used to monitor the various environmental parameters store over the server. Also Kulkarni Chaitanya suggested that, with the help of system they can detect the harmful gases and Excessive noise. This system is new concept which can detect both Air and Sound pollution. By reviewing all the above papers by the different authors it's been analyze that system for checking the dangerous levels of noise and generate report to authorities.

III. SYSTEM IMPLEMENTATION

3.1. Requirement Analysis –

Requirements analysis specializes in the obligations that verify the requirements or conditions to satisfy, Success or Failure is all depend on the system plans and methodology. Also its verification of terms and requirements, after the completion of user need the requirement of document gathering.

Need to collect the data, today the sensor-equipped, In machine learning technology "Learn from past experience" and try to improve our datasets for future use. For better performance. Learning and maintain information in the form of statistics, classification is the problem of identifying to which of a set of categories (sub-populations) a new observation belongs, and on the basis of a captured data and training set data containing measurement and tracking the instances, in which category they are. For find the probability and classification Naïve bayes algorithm is widely used. Also that system is called as smart. So, to develop the noise pollution detection system, it is important to define all tools as well as languages and libraries.

- *Hardware* - Node MCU ESP-12 Module, Sound Sensor, Jumper Wires
- *Software* – PhpMyadmin (Any Version), MySQL, JDK 7.0

3.2. System Analysis -

The sound pollution monitoring system is absolutely important for detecting the dangerous range of noise. Previously, data collectors had to travel long distances to the various locations to collect data, it is tedious task as well as no accuracy as well as that was lengthy and time consuming. But this developed system can be checked indoor as well as outdoor noise range. It has simple drive circuit, works on real time and has visual output based on graph or charts. IOT based noise monitoring and prediction technology is to ensure that collected noisy data is monitored and try to reduce with the help of authorities. It forms a communication medium from human to machine. Sensors and microcontrollers are communicated to the internet via network. Also it can monitor or capture the environmental parameters.

3.3. Problem Definition –

Prediction of noise range is not easy task, Number of parameter should analyze to generate the result. Extreme noise can damage hearing, sleep disorder, and cardiovascular disease, lack of concentration. Previous system only find the noise range, but no other function of predict as well as find the harmful range. Noise reduction is important, that why here I planned to develop the system which is able to monitor the noise as well as find the harmful range.

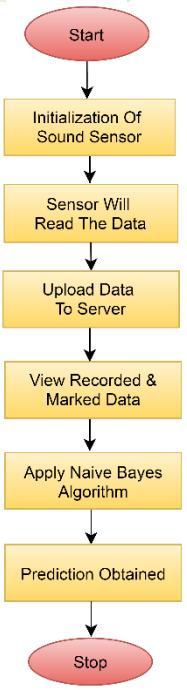

Fig. 2 : Noise Pollution Prediction System Flow Diagram

The block diagram shows, how the data is processed from sensor sensing to report generation and analysis. This is the complete sequence flow from start to end to analyze as well as monitoring process.

After that complete data is stored over the online server for further processing and operation monitored values. Based on that it is easy to predict noise is polluted or not.

3.4. Hardware Requirement -

- **Node MCU** – It is an open source micro controller device for IOT base platform that designs and manufactures single board microcontroller's module. For building smart digital devices. It has inbuilt Wi-fi, Power input supported 4.5V ~ 9V (10VMAX), USB-powered, ESP-12 module and these boards are able to read inputs from sensors.

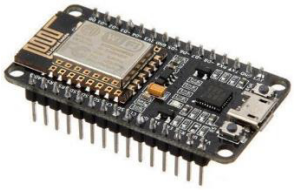

Fig. 3 : Node MCU ESP-12 Module

- **Sound Sensor** – The sound detector is a small component that combines a microphone and a circuitry. According to the principle of vibration or a specific frequency so sensitivity adjustable digital potentiometer is supplied with this module It working voltage 3.3-5V and output form is digital switch output (0 and 1)

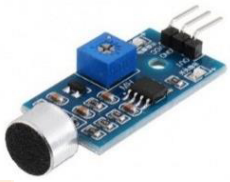

Fig. 4 : Sound Sensor Module

3.5. Module Connection / Wiring –

- **Jumper Wires** – A jumper wires a jump connector it is an electrical connector or organization of cables with a connector or pin at each stop which is commonly used to interconnect the components. Male to male, female to female, male to female connector.

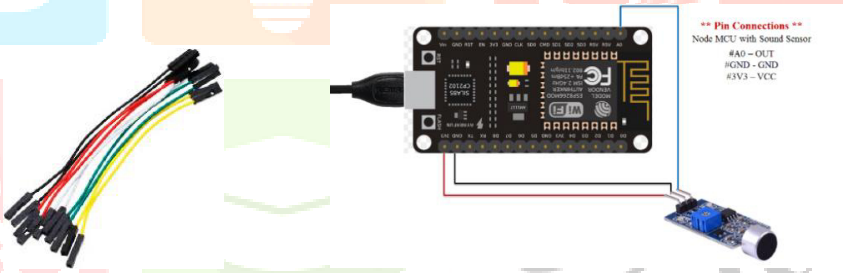

Fig. 5 : Node MCU Connection with jumper wires to Sound Sensor Module

Node MCU 3V3 Supply connected to pin of Vcc of sound sensor module. Ground (GND) Pin of Node MCU is connected to Ground (GND) pin of sound module. OUT pin of sound sensor is connected to A0 pin of Node MCU Module.

3.6. System Data Flow Diagram –

In the Fig. 6 dataflow diagram shows the complete flow of data from input to output. Sound sensor module is connected to NodeMCU microcontroller module.

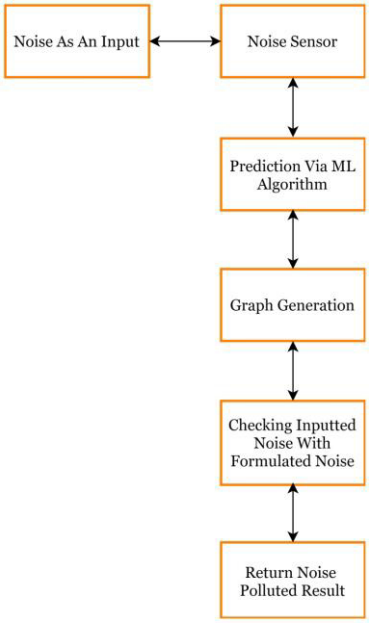

Fig. 6 : Noise Pollution Prediction System Data Flow Diagram

NodeMCU module has 4 MB data storage capacity as well as inbuilt Wi-Fi function. Sound Sensor sense the noise through the microphone attaches with it, after that the sense data is uploaded via NodeMCU microcontroller on server. Prediction is done using Machine Learning Algorithm, Captured values compared with the mark values and after that prediction is obtained. Successful generation of result the graph is generated on the basis of classification. Here the new collected noise is match or formulated with existing predicted noise for matching.

IV. SYSTEM WORKING

4.1. System Working –

This system uses sound sensors to sense presence of noise in the environment. NodeMCU model is the intermediate bridge to connect the sound sensor to the server route. It has capacity to store data up to 4Mb also it has inbuilt Wi-Fi module, so they can easily connect through any internet.

Proper configuration of the sound sensor, Sensor continuously monitor the environmental noise and upload these data values to the server. These values is fetch on mobile application, Here we develop one module to mark values, So naïve bayes algorithm try to match the harmful noise range with respective the marked values. And try to find which noise range is polluted or not. Graph is generated with the help of google api's. Fig. 8 graph shown captured data values.

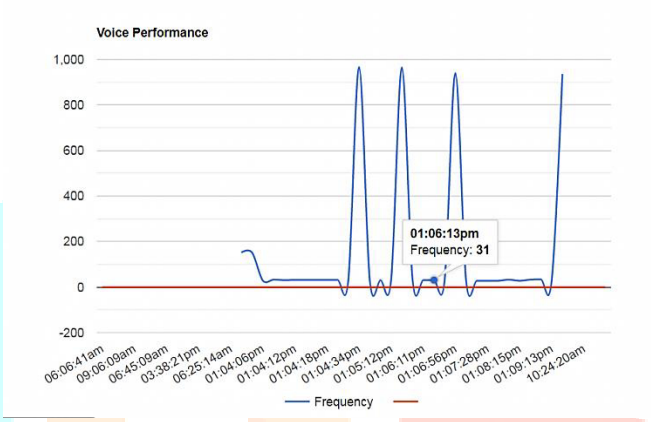

Fig. 7 : Data visualization (Curve Chart)

Here graph shows the peaks, Eg. Here pointer on Frequency 31 and time is 01:06:13pm, When system online this graph is generated and updated on every 5sec. Also authorities can access this link anytime anywhere to check the intensity sound, And take precaution over this.

4.2. Naïve Bayes Algorithm Used –

A naive Bayes classifier (NBC) is a simple probabilistic based method that may expect the magnificence club possibilities. A naive Bayes classifier can easily manage missing characteristic values by absolutely omitting the corresponding probabilities for those attributes while calculating the probability of club for every class. It also calls for the magnificence conditional independence, i.e., a characteristic on a given magnificence is independent of these of different attributes.

Data : 'Training dataset: D = $X_1, X_2, \ldots X_n$ // Training dataset, D, which contains a set of training instances and their associated class labels.
Result : noise list: $noise_{list}$
for each class, $C_i \varepsilon D$ **do**
Find the prior probabilities, $P(C_i)$
end
for each attribute values, $A_i \varepsilon D$ **do**
Find the class of conditional probabilities, $P(A_i \mid C_i)$
end
for each class, $X_i \varepsilon D$ **do**
Find the conditional probabilities, $P(X_i \mid C_i)$
if $P(X_i \mid C_i) == 0$ **then**
// Use Laplacian Estimator recalculate the conditional probability $P(X_i \mid C_i)$ using Laplacian Estimator
end
if X_i is misclassified **then**
$misClass_{list} <-- X_i$
$misPro_{list} <-- P(X_i \mid C_i)$ *// Store all the probabilities for all misclassified*
end
else
$pureClass_{list} <-- X_i$
$purePro_{list} <-- P(X_i \mid C_i)$ *// Store the probabilities for all purely classified instances.*
end
end
Tnoise = findMIN $(purePro_{list})$ *// Use as noise threshold*
for each instance $x_i \varepsilon misClass_{list}$ **do**
Find the conditional probablities $P(X_i \mid C_i)$ $misPro_{list}$
if $P(X_i \mid C_i) < Tnoise$ **then**
$noise_{list} <-- X_i$ *// Store the instance as noise*
end

end
return $noise_{list}$

Algorithm 1 : Noise Detection

Let D be a training set of data instances and their associated class labels. Each instance is represented by an n-dimensional attribute vector, X ={x1,x2,...,xn}, depicting n measurements made on the instance from n attributes, respectively,{A1,A2,...,An}.

Suppose that there are m classes,{C1,C2,...,Cm}. For a test instance, X, the classifier will predict that X belongs to the class with the highest conditional probability, conditioned on X. That is, the naive Bayes classifier predicts that the instance X belongs to the class Ci, if and only if P(Ci|X) > P(Cj|X) for 1 ≤ j ≤ m,j 6= i The class Ci for which P(Ci|X) is maximized is called the Maximum Posteriori Hypothesis.

$$P(C_i|X) = \frac{P(X|C_i)P(C_i)}{P(X)} \quad \ldots \text{Eq.1}$$

In Bayes theorem shown in Equation (1), as P(X) is a constant for all classes, only P(X|Ci)P(Ci) needs to be maximized. If the class prior probabilities are not known, then it is commonly assumed that the classes are likely equal, that is, P(C1) = P(C2) = ... = P(Cm), and therefore we would maximize P(X|Ci).

Otherwise, we maximize P(X|Ci)P(Ci). The class prior probabilities are calculated by P(Ci) = |Ci,D|/|D|, where |Ci,D| is the number of training instances of class Ci in D. To compute P(X|Ci) in a dataset with many attributes is extremely computationally expensive. Thus, the naive assumption of class-conditional independence is made in order to reduce computation in evaluating P(X|Ci). This presumes that the attributes' values are conditionally independent of one another, given the class label of the instance, i.e., there are no dependence relationships among attributes. Thus, Equation (2) and (3) are used to produce P(X|Ci).

$$P(X|C_i) = \prod_{k=1}^{n} P(x_k|C_i)$$
$$P(X|C_i) = P(x_1|C_i) \times P(x_2|C_i) \times \cdots \times P(x_n|C_i) \quad \ldots \text{Eq.2}$$

P(X|Ci) = P(x1|Ci)×P(x2|Ci)×...×P(xn|Ci) (3) In Equation (2), xk refers to the value of attribute Ak for instance X. Therefore, these probabilities P(x1|Ci),P(x2|Ci),...,P(xn|Ci) can be easily estimated from the training instances.

If the attribute value, Ak, is categorical, then P(xk|Ci) is the number of instances in the class Ci ∈ D with the value xk for Ak, divided by |Ci,D|, i.e., the number of instances belonging to the class Ci ∈ D. To predict the class label of instance X,P(X|Ci)P(Ci) is evaluated for each class Ci ∈ D. The naive Bayes classifier predicts that the class label of instance is the class Ci, if and only if P(X|Ci)P(Ci) > P(X|Cj)P(Cj) for 1 ≤ j ≤ m and j 6= i In other words, the predicted class label is the class Ci for which P(X|Ci)P(Ci) is the maximum.

Laplacian Estimation -

As in naive Bayes classifier discussed above, we calculate **P(X|Ci)** as the product of the probabilities **P(x1|Ci)×P(x2|Ci)×...×P(xn|Ci),** based on the independence assumption and class conditional probabilities, and end up with a actual probable value of zero for some **P(x|Ci).** This may happen if the attribute value x is never observed in the training data for a particular class **Ci.** Therefore, the generated Equation 3 becomes zeros for such attribute value regardless the values of other attributes. Thus, naive Bayes classifier is unable to predict the class of such test instances. In order to resolve such issues in our model, we use Laplace estimator *Cestnik (1990)* to scale up the values by smoothing factor. In Laplace-estimate, the class probability is defined as *Cestnik (1990)*:

$$P(C = c_i) = \frac{n_c + k}{N + n \times k} \quad \ldots \text{Eq.3}$$

Where nc is the number of instances satisfying C=ci, N is the number of training instances, n is the number of classes and k=1. Let's consider a phone call behavior example, for the behavior class 'reject' in the training data containing 1000 instances, we have 0 instance with relationship is qual to unknown, 990 instances with relationship=friend, and 10 instances with relationship is equal to mother.

The probabilities of these contexts are 0, 0.990 (from 990/1000), and 0.010 (from 10/1000), respectively. On the alternative hand in keeping with equation 2 the probabilities of those contexts could be as follows:
In this way we obtain the above non zero possibilities rounded up to a three decimal places severally victimization Laplace calculator outlined on top of these.

$$\frac{1}{1003} = 0.001, \frac{991}{1003} = 0.988, \frac{11}{1003} = 0.011$$

The "new" probability estimates are close to their "previous" counterparts, and these values can be used for further processing in our model.

- ***Noise Detection Technique -***

In this section, to discuss the noise detection technique in order to detect phone call, Machine running, behavior. Figure 1 shows the complete execution of noise detection system block and technique used. In order to detect noise, The implemented system use Naive Bayes classifier (NBC)[9] as the basis for noise identification. Using nbc we tend to rst calculate the probability for every attribute by scanning the coaching knowledge, The portable dataset Each example contains 4 attribute values, time, area and relationship and corresponding noise level behavior. For each attribute value, respectively for this dataset. Using these possibilities we calculate the conditional possibility for each example as nbc was implemented beneath the independence.

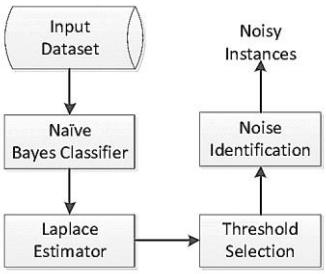

Fig. 8 : Input Phase

Assumption, it estimates zero possibilities if the probability for one attribute is zero attribute is zero. In such cases, we use Laplace-estimator [10] estimate the conditional probability of any of the attribute value. After the match value prediction it shows the "Number of record scans" and show the probability generated. Once we have calculated conditional probability for each instance, we differentiate between the purely classified instances and misclassified instances using machine learning.

4.3. Experimental Setup -

The implemented system is based on sound sensor detection which is based on iot technique With the help of and existing naive Bayes classifier based technique[11] Arduino ide is use to write sketch for the complete operation and andoid studio is able to run java as well as .xml files to develop the application. To execute them on a Windows PC with a minimal configuration Intel dual core, or i3 CPU and 4GB Ram memory. In order to measure the classification accuracy, we first connect the sound sensor to the NodeMCU with the help of wirings. Sound is capture and send these data over the server. Prediction is performed and shows the number of record scanned and probability. This identification technique from the training dataset, and then apply the decision-tree classifier [12] on the noise-free dataset. The reason for choosing the decision tree as a classifier is that decision tree is the most popular classification algorithm in data mining[13] [14].

4.4. Result Analysis –

The implemented system try to analyze the system, here need to review all the literatures research as well as algorithm for future system improvement. Existing system can only monitor the data generated by IOT sensor and it display on webpage. But this implemented system has ability to monitor the live intensity of data as well as to apply naïve bayes algorithm to find match, After the successful match of the sensor data final result shows the number of record scan and its probability, And data is polluted or not. Table that shows Existing System and Implemented System.

Table 1 : Existing System Vs Implemented System

Sr. No.	Existing System	Implemented System
1.	Get integrated with offline data prediction.	In proposed the online data prediction integrated.
2.	Can't work from anywhere.	Will help to perform diagnostics from anywhere.
3.	No live data prediction.	Live data taken for consideration.
4.	Prediction efficiency low.	Prediction efficiency high as compared to existing system.

After the successful connection of circuit estimated time is calculate to record data. Table 2 show the time in millisecond by existing system and implemented system.

Table 2 : Existing System Vs Implemented System Time Comparison

Sound Type	Existing System Capability	Implemented System Capability	Existing System Prediction Time	Implemented System Prediction Time
Traffic signal	Yes	Yes	0.90 (MS)	0.80 (MS)
Marriage Hall	No	Yes	0.919 (MS)	0.871 (MS)
Loud DJ Sound	No	Yes	0.929 (MS)	0.89 (MS)
Heavy Transport	Yes	Yes	0.910 (MS)	0.90 (MS)

Here table 2 shows about complete system capability to measure and maintain the data as per the result found. According to this table we can easily identify the difference.

Table 3 : Sensor Collected Data

Date	Sound (dB)
2020/06/12	33
2020/06/12	37
2020/06/12	34
2020/06/12	20
2020/06/16	100

Above table 3. Shows the complete data about sensor, which date sound was capture with his intensity. Here for date we use (YYYY/MM/DD) format to easily identify which year and month data was recorded. At the same time number of recorded values (dB) shows the intensity, and related graph is generated on the basis of these data. When the sensor is ready to monitor the data, these all values is stored onto the server.

Table 4. shows sound in dB, Sources of sound, City. Here "Noise Detection System" android mobile application is used to track the activity of noise measurement. Where at the range of 32-39, Noise sources should be Quite Library or Bird Calls. Another range is 100-110, Noise sources should be Motor Cycle, Blow Dryer or Concert creaming of child. As the number of parameter is measured.

Table 4 : Noise Sources Identified from values

Sound (dB)	Sources of sound	City
32	Quite Library, Bird Calls	Amravati
33	Quite Library, Bird Calls	Amravati
39	Quite Library, Bird Calls	Amravati
100	Motor Cycle, Blow Dryer	Amravati
110	Concert Creaming of Child	Amravati

Table 5. shows the measured Noise Value in dB, As well as related match data values, Means at the measurement of ***31 dB*** is found, so you have to ***"mark"*** these 31 dB value for prediction. Related Match Value is 31-33 dB values assigns "***Quite Library or Birth Calls".*** But sometime this data is variable distance to distance of some hurdles between system and actual noise pollutants. Most of time real noise generation and captured noise generation has some difference, According to that it may classify and perform action on these datasets. At the range of ***100 dB*** Match values is 100-110 dB and noise sources is Motor cycle, Blow Dryer.

Table 5 : Noise Classification from existing datasets

Noise Value (dB)	Related Match Values
31 dB	31 dB
	33 dB
	33 dB
100 dB	100 dB
	100 dB
	110 dB

At the result table 5 Shows that current sound value 110 dB.

- ***Total Record Scan - Marked*** values is count number of times.
- ***Probability Measure P(N) -*** Number of parameters with respective noise sources identified.
- ***Match -*** If similar values is found then it shows on page.
- ***Predicted Noise Sources –*** At that range naïve bayes classification algorithm identify the noise sources from existing values.
- ***Is Polluted -*** Noise polluted or not these page identify and display on page.

Table 6 : Result (Polluted Noise with his probability)

Sound Value	Record Scan (Current + Previous)	Probability Measure P(N)	Match Data (dB)	Predicted Noise Sources	Is Polluted
110	6	0.5	100	Motor Cycle	Yes
				Blow Dryer	Yes
			110	Concert Creaming of child	Yes
50	7	0.57	50	Quite Office	No
				Moderate Rainfall	No

Detected sound value ***110 dB***, At that time 6 records where scanned (Current as well as previous record number) and Probability found 0.5, and predicted noise sources Motor cycle or Blow Dryer, to analyses the all parameter here, we can say that at range of 100-110 db ***"Polluted".***

Another value is ***50 dB***, at the time of monitoring, Total 7 record scanned. Here probability measure 0.57, Here at the range of ***50 dB*** noise sources is ***"Quite Office or Moderate Rainfall".***

By considering all the parameters and analysis of noise data, here I say that, this system need low power, and less training with the help of Naïve Bayes Classification Machine Learning algorithm, that classify the noise range. Naïve Bayes classification is easy to implement and mostly used in e-commerce platform as well as software development. Suppose, you want to purchase product from ecommerce site, and try find any product, suddenly website shows you Alternative product related to your search. This classification is done by Naïve Bayes Classification in Machine Learning. Above both table 1 and 2 shows the result proves that, the implemented system takes minimal time to predict noise pollution, Whereas Existing System Try to capture the noise by using heavy site and some big hardware. Main evolvement in the noise prediction system is efficiency. This is a machine learning base prediction.

Machine learning concept is more important because, that models are more advance and with ability to classify and expose to new data, they are able to independently adapt. Actually this method try to learn from past experienced data / computations to produce reliable results. Result is displays in the form of graphs. Naïve bayes algorithm is widely and effectively used, it is simple and fast to predict test of classes. When assumption holds, a naïve bayes classification to better performance as compare to other logistic, regression and we need very less data. It is very well to categorize input variables and numbers.

V. CONCLUSION

Noise prediction system monitor and perform the different type of data from environment as well as vehicle, machinery, rock parties, Sound System (Dj) as well, so by obtained and superimposing the existing rolling noise models. And currently developed system compared with the existing noise models. It is found that developed system takes minimal time to identify harmful noise range with his category. Machine learning's Naïve bayes algorithm is helpful to classify the recorded parameters and models to calculate probability of polluted noise from measured data. Through case study analysis and validation of existing system as well as research papers, the improved model is better than the model given by existing model.

This developed System is based on the modern IOT technology and it is very eco-friendly and inexpensive, and does not harm the environment in any way. With the help of monitoring pollutants parameters, so made it an urgent need take action and to create awareness about the causes, effects, and prevention of noise pollution. This system can be used to get the knowledge regarding pollution in the area, and authorities can warn various industries about the level of pollution they contribute in and take the required steps and reduce noise thereby improving the public health of the populace.

VI. FUTURE SCOPE

Implemented system can be expanded in future in many ways to serve much more facilities. A web is created to store the data from cities and countries are available. Thus, providing a single platform to monitor and analyze noise pollution at various locations. These web platforms can act as a beneficial resource for making people aware of their environments. Noise pollution monitoring, this system can be extended to monitor water pollution also.

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